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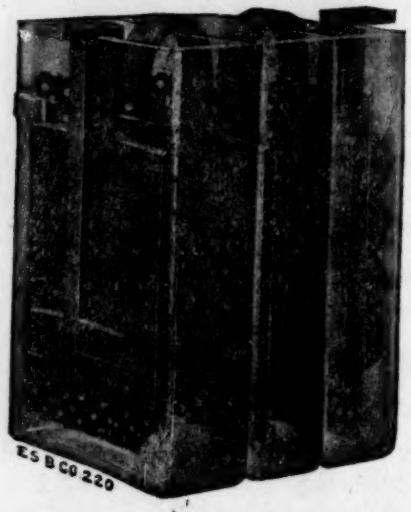

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THE NEED OF CONSERVATION OF OUR VITAL AND NATURAL RESOURCES AS EMPHASIZED BY THE LESSONS OF THE WAR[1]

THE great war, now ended, frightful as have been the evils it entailed on the world, should, from the standpoint of our country at least, be recognized as having brought to us an awakening in directions that will be of lasting benefit to the nation.

It has been a cheap and easy criticism to stigmatize our people as money-loving, self-centered, and materialistic, and this characterization, apparently generally held in Germany as a true picture of the people of the United States and of our national life, has, by some, even here at home, been more or less accepted as correct. The great soul of the American people, their intense patriotism and love of country, their devotion to ideals of right and of self-sacrifice and altruism, were not dormant but were hidden. We have enough of the Anglo-Saxon of our English brethren in us still not to seek to parade our better traits in boasting self-assertion—but when the time of trial and sacrifice comes, our people respond, and respond as a nation.

A marked instance of this national trait was given in our treatment of Cuba twenty years ago. It was incredible to some of our foreign critics that this country could enter into a war with Spain solely to remedy the abuses of her government of Cuba, and to free Cuba, yet the event showed that such was actually the case—and now the world recognizes that we entered into the world-war just ended, solely and only as a matter of high national duty—and with no thought of national gain in money, trade or territory, but only because we recog-

[1] Address of the Vice-President and Chairman of Section of Engineering of the American Association for the Advancement of Science, Baltimore, December 26, 1918.

nized a great duty to the fulfillment of which we must devote ourselves and to which we gave our national life and our nation's full resources.

But while our country entered on this task with no thought of gain, we have, in the accomplishment of duty, received great gain, not only in the spiritual uplift as a nation that we must feel in the realization of what as a nation we have done, but in the material benefits that have come to us from the new conditions forced by war necessities in our business life. These conditions are so many and involve such large and complex issues that they are staggering in their contemplation. Take the railroad situation alone, and consider the immense gain and enlightenment to the country resulting from the far-reaching changes in the government's attitude toward railroad management, necessitated by the war.

For years—for a generation—thoughtful and informed men have realized the want of logic and of business sense typified and enforced by national legislation in the Sherman Act and by the countless restrictive impositions of state legislatures on the proper and business-like management of our railroads—preventing pooling—forcing in the fierce competition for business the routing of freight over unnecessarily long routes—compelling absurdly low rates for service—and other restrictions generally having their incentive in political expediency rather than in careful economic study.

The public has erroneously been taught to believe that drastic uneconomic competition between our railroads, and also between our industries, should be encouraged, and indeed enforced as the law of the land, instead of the encouragement of wise economic cooperative regulation and understanding, tending to secure the best results at a minimum of waste in effort and money.

The war came—urgent war needs in transportation involving the transport of hundreds of thousands of soldiers and of enormous quantities of material, made essential cooperative management of our transportation lines. A Director-General of Railroads was appointed —and presto, in a night shall we say—all the unnecessary and vexatious restrictions on cooperative methods in our transportation systems were set aside—the government instinctively adopted business methods in the management of business enterprises, the Sherman Act was ignored, and the Interstate Commerce Commission was relegated for the time to dignified isolation and a condition of innocuous desuetude. For years the railroads had urged and shown the impossibility of keeping up their plants and equipment and of rendering due and proper service without proper and adequate remuneration in freight and passenger rates. The government, suddenly saddled with the actual responsibility of operation, and brought fact to face with a realization that the railroads it had taken over could not be run on air, brushed aside statute law and political criticism, and summarily, as a war measure, raised the charges for passenger and freight service, in reality a measure long needed in peace—and the public accepted it all—and labor benefited by increases in pay which the public was forced to provide. In industry the same lesson was enforced by the war. We were suddenly brought to an appreciation of the fact that Germany's conservation policy in her support of the practise of cooperative effort rather than that of destructive competition had built up an organization of economic strength that enabled her, from her national resources at home, without outside aid, to play the aggressive and enormously strong part she maintained up to the very end of the war.

The war has, in transportation and in national industry, taught and enforced on our nation—quick to learn—these lessons of waste in the past and of future economic management by joint cooperative effort, and of all the lessons of conservation of our resources taught by the war, those of needed cooperative effort in our railroad and industrial interests are perhaps the most prominent and important in a material sense, and the lesson has been one not only to and for the public and our national and state authorities, but one by which those interests are directly benefiting. The railroad

managers are diligently studying these problems. They are men of great experience and ability—and the chairman of their association has voiced their progress by publicly saying:

> The whole question of the ultimate return of the railroads to private operation has been considered together with the development of a system of public regulation and control for the future which shall not only protect against abuses, but be affirmatively helpful to the development of adequate transportation facilities for the great after-war tasks of the country.

While, as a war measure, the temporary possession and operation of our railroads by the government was necessary, the continuance of such a system in peace, or of any measure of government ownership with its political evils, would be a calamity depriving the traveling public of the efficient operation naturally coming from the initiative and enterprise and sense of responsibility attending individual management, and always absent where governmental red tape and autocratic authority rule, regardless of the comfort or needs of the public. Some reasonable, responsible governmental oversight or control of these great interests is without doubt necessary. The war urgency, the more intimate relations that war needs have established between governmental agencies and railroad and industrial managers, must and will lead to the establishment of systems of regulation not destructive but constructive in character, that will operate to the lasting benefit of our country.

The need of conservation and development of our latent water-power resources has been emphasized by the war. For years, since the public study of the conservation of our natural resources was initiated in 1908 by President Roosevelt's call for a conference of governors of our states to consider the matter—the National Conservation Congress, and Conservation and Forestry Associations throughout the country, have studied the problem of how best to conserve, and yet to use the country's natural resources, in water-power, and in our mines and forests. When we were brought by this war to realize our dependence on Chili for our supply of nitrates in the manufacture of ammunition, while Germany had evolved and developed economical methods of utilizing her water powers and of extracting nitrogen from the air, we were taught another lesson in conservation and of the folly of our dilatory laissez-faire system of dealing with the water problem. Under war pressure greater progress has perhaps been made than would have been possible in many years of deliberate peace methods. Serious differences of opinion have existed in the past as to the proper measure of governmental control that should be exercised in the development and use of the great latent water powers of the west, and enabling legislation has been impeded and halted by visionary and wholly unpractical objections to such reasonable and liberal legislation as would encourage capital to enter into and support such development. As a wise westerner has said of the development of the west in the past: "The western country was never settled, and never could have been settled, with thirty cents and an infant class," and conservation of our natural resources was well defined by Dr. C. W. Hayes, when chief geologist of the U. S. Geological Survey, as "utilization with a maximum efficiency and a minimum waste."

It is the use, and the avoidance of the abuse, of our natural resources, that conservation properly teaches, not the locking up of these resources. Now in this urgent, intensive war experience a broader national vision has developed. We have learned and have become accustomed to figure in billions, where we used to fear that millions would be wasteful. The government has taken hold of great questions with a giant hand, and has, by its conversion to the truth that in its conduct of great enterprises great men, experienced in the work contemplated, should be used rather than avoided with suspicion, accomplished great results—and the lesson has been enforced that when needed to attain results, large expenditures may lead to the greatest economy in methods and certainly to greater success in the attainment of ends. Our great corporations may, in view of the government's housing programs, be encouraged to feel that proper measures to that end are a necessary concomitant to the maintenance of satisfactory labor conditions, and

are an economic necessity in large and small operations.

One great lesson in conservation peculiarly applicable to our nervous, energetic, and always hard-working people, we have not yet adopted, because we are so constituted that as a nation or a race we will not learn it, is that of the better conservation of our vital resources.

The National Conservation Congress, in its several yearly sessions, has taken, among others, as subjects for study and discussion: Forestry, The Improvement of Farm Conditions, Water Powers and The Vital Resources and Health of our People. When will we learn the lessons of the last, the vital importance to our people of learning to conserve their strength. No one has better epitomized the American wastefulness of vital energy than dear old Mark Twain, who (writing from Naples in 1867), sent us these words, pregnant with the lesson of the higher conservation of life:

> We walked up and down one of the most popular streets for some time enjoying other people's comfort and wishing we could export some of it to our restless, driving, vitality-consuming marts at home. Just in this one matter lies the main charm of life in Europe—comfort. In America, we hurry, which is well; but when the day's work is done, we go on thinking of losses and gains, we plan for the morrow, we even carry our business cares to bed with us, and toss and worry over them when we ought to be restoring our racked bodies and brains with sleep. We burn up our energies with these excitements, and either die early or drop into a mean and lean old age, at a time of life they call a man's prime in Europe. When an acre of ground has produced long and well, we let it lie fallow and rest for a season; we take no man clear across the continent in the same coach in which he started; the coach is stabled somewhere on the plains and its heated machinery allowed to cool for a few days; when a razor has seen long service and refuses to hold an edge, the barber lays it aside for a few weeks and the edge comes back of its own accord. We bestow thoughtful care upon inanimate objects but none upon ourselves. What a robust people, what a nation of thinkers we might be, if we would only lay ourselves on the shelf occasionally and renew our edges.

Surely Mark was right in this.

We owe a duty of watchfulness to the men, devoted to public service, who ably lead great movements for the betterment of conditions among our people—men who are not only captains of industry, but generals in the army of public service, and leaders and exemplars in the pursuit of public duty. They become in leading these great movements, in a measure, the custodians of the public welfare, but "Quis custodiet ipsos custodes?" Who shall care for these very generals, and see that they conserve the store of intelligence, patriotism and energy, that goes out from them to public welfare, that it may not be prematurely exhausted? Surely we should take measures to have them feel how the nation values them as a public asset, and how they owe it to their country as well as to their homes to heed and to preach to others the wise words of Mark Twain.

We perhaps can not conclude that the great war has really taught us to better conserve our vital resources in our men and women, for they have been prodigal in expenditure of their strength in national service, but may we not hope that following the past one hundred years of uninterrupted peace between the English-speaking peoples of the world, the closer bond that the war has promoted between our English brethren and ourselves, while giving them a better and closer estimate of us, may bring to us a better appreciation of the value of conserving life as they conserve it, giving our nation the valued services in their advanced years of men who, under our more intensive life, would have reached their limit of usefulness.

To our engineering profession is due the early study of the doctrines of conservation, later taken up by our publicists and legislators. Conservation is primarily an engineering question. At the first, the organization meeting of the American Institute of Mining Engineers, held in May, 1871, now nearly half a century ago, which I attended, a committee was appointed "to consider and report on the

waste in coal mining" and as the whole subject of the conservation of all our resources developed and was studied, it has always been the engineers of the country, qualified by training, expert knowledge, and intelligence, who have led and must now lead in the study and broad consideration of our best national policy in conservation. It is the duty of engineers to keep in the forefront of the study and teaching of this matter, and to do their expert share towards shaping the policy of the nation to a course based on reason, economic principles and technical knowledge, rather than on sentimental or political diatribe. A greater danger is threatened to the public interests by the untrained, spasmodic, semi-political, and careless presentation and handling of these matters before the public, by men on whom their importance has suddenly dawned, than by a continuance of erroneous methods of the past. The trouble with most of the plans for railroad and business regulation, and for mineral and water-power conservation, proposed by men untrained and inexperienced in engineering and in business and financial methods and problems, is that their plans are apt to be ideal rather than real, their dicta negative and destructive rather than affirmative, positive and constructive, and their remedies untried and theoretical experiments, rather than of practical and efficient effect.

We should recognize, and this great war's awakening and upturn of all preconceived and preexisting conditions has emphasized, the importance of business-like rather than political management of our national transportation and industrial interests, and of all other national affairs involving expert scientific or business knowledge and training. Our country owes an incalculable debt of gratitude and appreciation to the great interests that have led in and made possible the wonderful transportation and industrial development of our land, and we may find that on a large scale we will be killing the goose that lays the golden egg of national prosperity, if we suffer our railroads and our great industries to be nagged and oppressed to the point of possible insolvency by blind unreasoning prejudice largely born of ignorance, and largely based on political considerations that should not control. The present agitation of the whole subject has a high educational value for our people, and we may be certain that we can in the end trust the horse-sense, the intelligence that in the long run is characteristic of our people, not to be finally led away by 'isms or wild theories, but to use in the final determination of these questions that independence of judgment and sound common sense so characteristic of and inherent in the American people, and for which our politicians so often make the mistake of not giving the people credit.

What better summary of the existing conditions following the war has or can be given than the following from the St. Louis *Star*, comprehensive in its scope, yet wonderfully succinct in its statement?

A GREATER HUMANITY RISES FROM WAR

During the process of readjustment we shall profit from the lessons the war has taught. In that, aside from freedom for all the peoples of the world, will lie the greatest achievement of the war. When the balance is struck the profit will outweigh the loss. The human lives sacrificed will yield a better and a greater humanity. The cost in dollars will be absorbed quickly in passing years. The material gains will live and produce.

We, in America, have learned something of our strength. We have learned the possibilities of our united effort. We have learned economy. We have learned concentration. These things will mold themselves into our national character. We shall act with a new inspiration. We shall feel a new confidence. We shall have a new consciousness of the invincibleness of righteous purpose.

HENRY STURGIS DRINKER
LEHIGH UNIVERSITY

CHEMISTRY AND MEDICINE: A TRIBUTE TO THE MEMORY OF JOHN HARPER LONG[1]

DR. LONG'S life and work, so ably portrayed by Professor Dains, are an eminent instance of

[1] An address given November 22, 1918, before a joint meeting of the Institute of Medicine of Chicago and the Chicago Section of the American Chemical Society.

the value of the work which lies in the great field of effort resulting from the relations of chemistry to medicine. For many years the main subjects of his investigations were enzymic action and problems of nutrition, researches of equal interest and importance to the progress of medicine and to the advancement of chemical knowledge. No less close and vital were these relations in the important spheres of influence which Dr. Long had created about himself outside of his laboratory, as instanced by his service of twenty years on the Illinois State Board of Health and by his connection with the Council of Pharmacy and Chemistry of the American Medical Association from its inception in 1905 to the end of his life. The same breadth of interest, supported by his great ability and fearless honesty, led to his selection as a member of Dr. Remsen's famous referee board, and in the last year of his life also to his election to the presidency of the Institute of Medicine of Chicago, which was founded in large measure to further the cause of medicine through the stimulation of research in all fields contributing to the advancement of medical knowledge.

Dr. Dains has discussed in an admirable fashion the details of Professor Long's valuable contributions to science and to the cause of humanity, and I have felt that I could pay no truer tribute to the high aims and achievements of my life-long colleague and friend than by attempting to outline to-night some of the important features of the relations between chemistry and medicine and thus help to have the cause "carried on" which Dr. Long so nobly served and had so greatly at heart.

From its earliest beginnings chemistry has found in medicine one of its greatest sources of inspiration—indeed, the very name of our science refers to the dawn of chemical knowledge in the temples of Egypt, the "land of Chêmi," where priests prepared simple remedies and studied their chemical nature. This close connection persisted through the centuries and found perhaps its crowning culmination in the persons of two modern giants of the medical world—the greater one, Louis Pasteur, the chemist who turning to medicine and using his chemical knowledge and its exact criteria in its service, founded the knowledge of disease through microscopic organisms, the very foundation stone of modern medicine, and the second, Paul Ehrlich, who inaugurated the present most promising era of combatting these dread causes of disease by the development of specific remedies, produced artificially in the chemical laboratory in the form of pure chemical compounds. Between these two extremes, the cause of disease and its cure, chemistry has found such an infinite variety of lines of effort contributing to medical knowledge that I must necessarily limit my subject and I shall do so by confining myself in large measure to those phases of it with which I am personally most familiar. How necessary such a limitation must be is no better shown than by the fact that at the present moment medical science seems to be turning to chemistry more and more as an essential factor in every one of its fundamental branches. That chemistry was essential in bio-chemistry and in physiology has long been well understood, but of recent years pathology also has turned to chemistry for the solution of its most important problems; the best preparation for a bacteriologist, I am told, is long and advanced training in chemistry; and even the great science of zoology, so long held in thrall by the obvious fact of form, has now turned to chemistry. How vital these applications of our science are, has been impressed most insistently perhaps on me by the the fact that some biologists seem at length to have reached the conclusion that those most important of all factors in human life, in the very evolution of our race, the factors included in the collective name of heredity, must owe their wonderful power of transmission of characters and character in final instance to the chemical nature, the specific chemical character, of chemical molecules.

With this glimpse into the vast vistas of present and future developments in the domain of the relations of chemistry to medicine, I must turn from these most alluring questions

and ask what my own chosen field of chemistry, which for the lack of a better name we still call pure chemistry, can contribute to the cause of medicine. Let me say at once that I speak almost on the defensive, I have been asked so often by eminent physicians, by physiologists and biologists of every kind, why chemistry is so intolerably slow and backward in solving what are quite obviously chemical problems—problems striking at the very root of our health and happiness. The answer very simply is this: Pure chemistry aims to be and is an *exact* science; indefinite mixtures of substances, such as our tissues and secretions represent, interest us, it is true, most deeply, but we can handle them altogether successfully only to the extent that we can isolate from them pure principles for exhaustive, *complete* investigation, so complete that we do not rest until we have dissected the molecule of the pure compound, have put it together again, and thus have acquired first hand knowledge of the exact function of each of its members. In the same way, systems that contain more variables than we can control *rigorously,* as rigorously as the mathematicians, the physicists and astronomers control their material, pure chemistry puts aside until such a time when our knowledge has advanced far enough to give us exact knowledge of each component in the system, to make possible a rigorous analysis of the whole system. Every physician knows what medicine would be without dissection, without an exact knowledge of the structure and location of the organs and members of the body—every physician knows too how the functioning of the parts in the whole can be understood only by an accurate study first of the functioning of each organ and each member. Now, the scientific dissection and reconstruction of the molecules of important isolated principles is as a rule an extraordinarily difficult problem. Thus it took Baeyer, perhaps the greatest organic chemist of his generation, some fourteen years to determine what we call the structure of indigo, containing only some thirty atoms. But, his success opened the way with the inevitableness of fate to one of man's triumphs over nature: for with the knowledge of its structure, the key was gained for the successful synthesis of indigo and its artificial preparation on a large scale, releasing many acres of land for the growth of other important products for human use. It took altogether some thirty-four years to complete the campaign for the successful production of indigo, and at that the campaign was planned and conducted by some of the keenest minds in our science and sustained by the prospects of rich rewards in gold for the successful issue! Similar vital work was carried out with other important dyes, such as alizarin or turkey red, methylene blue, magenta. I am emphasizing these facts, not only to illustrate the method of pure chemistry, but primarily to show what the successful issue of its efforts means. These and other dyes had been used commercially with an empirical knowledge during the many years that great investigators studied them from the point of view of chemistry as an exact science —but with the successful issue of their efforts in the profound analysis of the molecular structure of fundamental dyes, chemistry has gained for man supreme and practically unlimited power over the whole problem of color! It has made it possible for us to make at will a dye of any properties we may desire—fast dyes for any fabric, unstable, sensitive dyes for photography, dyes of any conceivable shade, fluorescing, if you please, with any desired hue! This instance of the power gained by chemistry has already proved to be of great value in medicine, by the development of stains to differentiate cells, microorganisms, tissues of every variety.

The lesson of this conquest of the world of color by man would be wholly lost, if you did not carry from here the conviction that the methods which have scored so brilliant a success in one field are absolutely certain to be equally successful in conquering the greater world of bio-chemistry. The methods evidently are painfully slow. It took two generations to complete the conquest of color—would ten or twelve generations be too long for the supreme conquest of the chemistry of life? The campaign has already long been

started and many a great victory is a promise of the complete triumph that must ultimately come. I shall attempt to outline for you three of the greatest problems which chemistry is facing in a titanic effort to invade and explore to its minutest parts nature's most precious domain—life: the problem of the synthetic remedy, the problem of the specific remedy, and greatest of all, the problem of living matter.

A brief survey of the development of our power to produce and control local anesthesia may serve to illustrate the kind of service chemistry is trying to render medicine in the domain of the synthetic remedy. The discovery of the effect of cocaine in removing by a simple local application all sense of pain where it has been applied, is, I believe, considered one of the great blessings of modern medicine, an aid to the surgeon, no less than a godsend to the patient. When cocaine was first exploited, there were two serious drawbacks to its use; one, its great cost—it was said to be worth its weight in gold—which necessarily limited its employment; the other, its poisonous character, by reason of which there were occasional fatalities connected with its employment. The story of the exploration of the structure of the molecule of cocaine, like that of indigo, is for the chemist a most thrilling and romantic tale—great chemists made advances, only to meet with ultimate defeat—exactly as great explorers did in the investment of the secrets of the domain of the North Pole or of the heart of Africa—until finally the penetrating genius of Richard Willstaetter succeeded in reaching the great goal. The results of these investigations are found not only in the fact that medicine has now a host of valuable substitutes for cocaine, which have powerful anesthetic properties without dangerous secondary effects but even more than the gain in materia medica is this: in the conquest of the world of color it was found that color is primarily due to certain specific groups of atoms in the molecules of dyes, or rather, vice versa, that specific combinations of a few atoms in the molecules of compounds give specific properties and functions to these compounds. This is, of course, really a fundamental law of chemistry revealed again in so complex a field as dyes. Now, exactly the same kind of *specificity* should be found in medicaments—that is, each specific function should be found to be the result of the presence of perfectly specific groups of atoms in the molecules of the medicaments. It is this application of the principles of pure chemistry which we can follow in the planned production of new and better local anesthetics and it is this application which points the way to one of the greatest lines of research for chemistry in the service of medicine—to determine by exhaustive investigation the peculiarities of an atomic group which will give the clean physiological effects which every physician would like to have at hand in the treatment of disease. The path would thus be eventually opened to a truly scientific materia medica. In the dyes we have been able to control secondary effects, such as stability or fluorescence, and we have every reason to believe that chemistry can accomplish the same results and avoid untoward secondary effects in the problem of obtaining specific physiological effects.

The tremendous development of the production of so-called synthetic remedies is the visible manifestation of the application of chemistry to the kind of research I have outlined. A large part of this manufacture of synthetic drugs is, no doubt, of no permanent value, a far too large a portion is unquestionably even detrimental to the best interests of medicine as the result of claims that are, to say the least, too sanguine and often without an adequate basis of fact. Again the lure of gold is marring while stimulating this great effort in behalf of mankind. But that real progress has been made has been amply demonstrated by the situation in this country in the matter of synthetic drugs, resulting from our war with Germany: this has separated the wheat from the chaff and shown that there indeed are a number of drugs, invented by chemistry, which may be considered vital in the treatment of disease.

The second line of research in the application of these methods of chemistry to the prob-

lems of medicine, which should be emphasized, is that which has found its most convincing expression in Ehrlich's great work on salvarsan and neo-salvarsan, now known to us by their American official names as arsphenamine and neo-arsphenamine. This is the most convincing instance of the wonderful opportunities in developing the specific agent that will kill a specific invading germ without permanent injury to its host. Quinine was, I believe, the first specific of this kind, and it would seem that it would have been only a single self-understood step from the use of a natural chemical compound to the development of synthetic chemicals for similar purposes—but it took an Ehrlich to take the first great and successful step in that direction. Ehrlich, like Pasteur, was a chemist before he became interested in medicine and it is important to know that in developing arsphenamine he used all the resources of pure organic chemistry, his special field, changing the structure of the molecule he was developing, here a little, there a little, putting an apparently slight but essential finishing touch here and there, just as a sculptor would handle his clay and his marble. Finally after six hundred and five preliminary studies the product needed to produce the desired effect was perfected! In arsphenamine the ordinary path of synthesis was abandoned, that is, the ordinary path of taking a natural product like indigo, cocaine, or atropine and finding out the secret of the constellation nature had constructed. Ehrlich struck out to build his own cunning molecular contrivance to kill the invading germ without harm to the host and he succeeded brilliantly! For many other diseases due to bacterial invasion medicine is now using specific antitoxins and vaccines, manufactured in some host or medium by the germs themselves. With the curative agency we find inevitably substances poured into our systems which are not needed for the effect desired and which may indeed be harmful. For instance, a child unfortunate enough to have received a prophylactic dose of diphtheria antitoxin is exposed to the dangers of anaphylactic shock if later an actual attack of diphtheria develops and the treatment with antitoxin is indicated in an effort to save its life. Surely, physicians would prefer to use some pure specific if chemistry could prepare one, equally efficient, equally potent. The effort to prepare such chemical specifics has been blazed by the discovery of arsphenamine and invites untiring research efforts on the part of chemists. Some of the other synthetic drugs which have already been prepared are specifics, if not in the sense of completely curative agents, at least as alleviating remedies of the highest value. The demands for luminal for the relief of epileptics, which have come in since its importation was stopped by the war have been pathetic in the extreme, and the gouty sufferer on the other hand has been grateful that almost without any delay American chemists were able to produce phenyl cinchoninic acid or atophan, which clears the system of the ache-producing uric acid!

We now come to the third and last field of effort of pure chemical research in the service of medicine which I should like to include in this short sketch—the study of the chemistry of life itself, of protoplasmic agencies and activities. Such a study is clearly so fundamental that it must ultimately give the world the rational basis both for preventive and for curative medicine. The problem obviously is a tremendous one that must be attacked by many workers from many sides and it will take generations of toilers to complete the great undertaking. That complete knowledge will come no one can doubt who has followed the brilliant advances made in the last sixty years. At this time I can refer only to a very few phases of this slow but triumphant march of our science to the knowledge of the chemistry of life—a few phases which illustrate different lines of attack and which at the present moment hold out the greatest promise of success.

First, let me recall the fact that Pasteur's first great contribution to science, as a young chemist of twenty-six, was the discovery in a study of the crystalline character of tartaric acid, that matter may be arranged in molecules in space in an unsymmetric fashion, yielding

distinct forms, which have in the simplest cases the same relations to each other as my right hand bears to my left, and that shortly after, he made the remarkable discovery that living matter discriminates sharply between two such forms, which are identical in every particular except that the one is the optical image of the other. Thus, he found that dextro-tartaric acid is destroyed by ferments, lævo-tartaric acid is not. It is of interest to mention, in passing, that this very discovery, arising out of pure chemical researches, was the fortunate incident in Pasteur's life that drew his attention to fermentation and opened the path to his great work on the germ theory of disease, to which medicine owes its present strength.

The mode of attack used by pure chemistry is to isolate pure compounds and study them exhaustively, both as to structure and as to their chemical activities. In attacking the problem of protoplasm we must isolate such of its components as we can, the materials it uses as food, the materials it excretes, and study each exhaustively. Thus, another great leader in this field, Emil Fischer, has laid the foundation of the chemistry of carbohydrates by his brilliant studies of the monosaccharides. How important these studies are for the science of protoplasmic activity is shown by the fact that of the sixteen stereoisomeric aldehyde-hexoses, differing only in the space arrangements of the atoms in their molecules, only three, d-glucose, d-mannose, d-galactose, are directly fermentable! Fischer, again, in his classical researches on the amino-acids and the polypeptids has been laying another broad and sure foundation for the study of the ultimate chemistry of the proteins. It is characteristic of the greatness and thoroughness—and the slowness—of the methods of pure chemistry that this study of the chemistry of proteins is growing in the same way that a magnificent monument would be erected. It is well-known that any one of the beautiful cathedrals of Europe was constructed as a rule not in one generation and by one architect, but rather slowly grew as the product of the efforts of succeeding generations, of the genius of successive architects. We see now only the foundations of the monument of the chemistry of the proteins, laid with painstaking accuracy, by workers in all countries. None of us will live to see the completion of the monument in all of its glory, but those who best understand the work have a supreme faith in the ultimate realization of their vision—and with it must come an insight into the nature of protoplasm and of life which no other study can hold out to us in like measure.

What a wealth of problems lies ready for the bold investigator! We may think of the isolation and exhaustive study of the active principles of the secretions of the internal glands, on whose presence in balanced proportions our healthy existence depends in so large a measure. Suprarenin or adrenalin has already been isolated by our American Abel and prepared artificially by the Germans, Stolz and Flaecher. The active principle of the thyroid gland has been isolated by E. C. Kendall of the Mayo Laboratories and found so potent, that an unbelievably minute amount injected into patients makes the difference between disease and health. Dr. McCollum is closing in on the secret of the active principles in our food commonly called the vitamins: should they prove to be organic and not vital mineral components, a study of their chemical nature and the structure of their molecules would follow, and what a triumph for humanity if we could then produce them from waste products like coal-tar and help out the fast decreasing ratio between supply and demand of dairy and similar products in crowded populations! You men of medicine do use organs of animals, ground or extracted, to make good a deficiency in this or that secretion in disease, but how much greater would your confidence in your therapy be if in place of mixtures of uncertain potency, pure chemical products were at your disposal. It is not so long since you used to employ your most important specific alkaloids in the same uncertain way, but what modern doctor would now hesitate in his choice between strychnine and nux vomica, atropin and belladonna, morphine and opium! Moreover, the isolation of

the pure alkaloids by the chemist has put into your hands the swift weapon of intravenous injection and the same promise is held out for the pure isolated principles of glands.

Isolating and investigating pure principles of food, of excretion, of physiological secretion, even to the point of the structure of their molecules, is a great and important task of pure chemistry, but it deals with only half of the great problem. Life is dynamic, it is material *in action,* and hence there is another great side to the problem of the chemistry of life, namely, the relations of the laws of chemical action to life. Every advance in our studies in physical chemistry, the branch of chemistry in which we study chemical dynamics, has found its important reflection, often its immediate reflection in its applications to life phenomena. Thus, the principle of the conservation of energy in chemical changes forms the basis of a large and vital part of the work on food values and their relation to proper sustenance. Then, we have the applications of the laws of solutions and of the theory of ionization in the use of saline injections, in the problems of fertilization as studied by Loeb, in the study of the regulation of the heart beat. We have the application of the laws of reversibility and equilibrium by Hill and by Emmerling to demonstrate the reversibility of enzymic action and thus to account in some measure for the synthetic processes of protoplasm, without which life would be impossible. The studies of the laws of catalysis or acceleration of action is another study fundamental for the understanding of life, for, as Ostwald has said, our bodies are wonderfully controlled machines in respect to that fundamental factor of nature, the *time* factor. I need not emphasize the significance of the time factor in medicine, for we all know that health and disease are distinguished in no way more characteristically than by such time factors as heart-beat, respiration, rate of growth, rate of elimination, of decay. Our time controlling devices are essentially the catalyzing enzymes and the investigations of their mode of action, of their production and control in the body belong to the most important ones in medicine. Such diseases of nutrition as gout and diabetes are most likely the result of abnormalities of enzyme supply.

How rapidly a discovery in physical chemistry may find its application in the study of life activities is well illustrated by this instance: Professor Wilder D. Bancroft at Cornell University a few years ago made some extremely interesting observations connecting emulsions of oil in an aqueous medium with the presence of sodium and calcium oleates in the medium of the emulsion. By varying the ratios he could produce at will an emulsion of oil in the aqueous liquid or an emulsion of the water fluid in the oil. These genial observations were hardly published when Dr. Clowes, of Buffalo, applied their principles successfully to such problems as the clotting of blood, the coagulation of milk, the chemical fertilization of eggs, à la Loeb, and to anesthesia! This work is a brilliant instance of the rôle played by colloid chemistry, the chemistry of colloid dispersions, in life phenomena. Since the major part of our bodies is a complex aggregation of colloid systems and since every particle of protoplasm is itself a colloid, the importance of this side of chemistry for the study of life can not be overestimated.

It is evident, therefore, that all phases of physical chemistry as well as the analytical and synthetical sides of pure chemistry are finding vast fields of investigation for chemists in the domain of medicine and its fundamental sciences, fields drawing to themselves ever increasing numbers of ardent workers. The friend and collaborator whose memory we are cherishing to-night was himself an indefatigable worker in this great cause, whose ultimate goal is a complete and masterful knowledge of the science of living matter. We can in no way pay greater tribute to his memory and devoted career than to pledge ourselves anew to continue our own modest efforts toward the upbuilding of this monumental undertaking of man's courage and genius, although we well know that only fu-

ture generations will see the glories of the completed monument!

Julius Stieglitz
The University of Chicago,
Chicago,
November 22, 1918

EDUCATIONAL EVENTS

BIOLOGICAL SURVEYS OF STATES BY THE UNITED STATES DEPARTMENT OF AGRICULTURE

Natural history surveys, dealing with the geographical distribution, habits and relations to environment of birds and mammals, with particular reference to the utility of the information gathered to the proper solution of problems in game protection, public health, forestry, grazing and agricultural practise, were carried forward in several states by the United States Biological Survey, Department of Agriculture, and cooperating institutions during the field season of 1918.

In Wisconsin the work of the Biological Survey was conducted, as since the beginning of investigations in that state, with the cooperation of the Wisconsin Geological and Natural History Survey, of which Dr. E. A. Birge is director. The personnel of the field party operating during the season included Dr. Hartley H. T. Jackson, Biological Survey, in personal charge; Mr. A. J. Poole, U. S. National Museum, as his temporary assistant, for the Wisconsin Survey, and Mr. A. I. Ortenburger, temporary assistant Professor George Wagner, of the University of Wisconsin, administers the interests of the Wisconsin Survey in the undertaking. Investigations were made in the distribution and habits of mammals, birds, reptiles and amphibians, the greater portion of the season being devoted to the upper Wisconsin River valley.

In central Montana Mr. M. A. Hanna, temporary field assistant, prosecuted the work under the direction of Mr. Edward A. Preble. This is the third consecutive season of field work in Montana, during which the southern half of the state east of the mountains has been covered.

A biological survey of Florida was undertaken by Mr. Arthur H. Howell, with Mr. Charles H. M. Barrett as field assistant for a part of the time. Investigations were made chiefly in the southern part of the state from Lake Okeechobee to Cape Sable and on the west coast from Sarasota Bay northward to Homosassa. Special attention was given to the fauna of the Royal Palm State Park, in the southern Everglades near Homestead.

Field investigations in Arizona in general charge of Mr. E. A. Goldman, now in France as a major in the Sanitary Corps, have been conducted over several seasons, being carried forward during the past summer in extreme southwestern Arizona by Mr. A. Brazier Howell, of California. There is left still unworked the southeastern portion only of the state.

Surveys of New Mexico, North Dakota and Oregon have recently been completed under the general direction of Mr. Vernon Bailey. Reports on the mammals, birds and life zones of these states are completed or in various stages of preparation.

Work in Washington was performed in informal cooperation with the State College of Washington, Pullman, and the State Normal School, Cheney. The personnel of the field parties operating included: Biological Survey, Dr. Walter P. Taylor, in charge, assisted by Mr. George G. Cantwell, reservation inspector, and for a short time by Mr. Stanley G. Jewett, predatory animal inspector; State College of Washington, Professor William T. Shaw, in charge, assisted by Mr. O. H. Homme, temporary field assistant; State Normal School, Cheney, Professor J. W. Hungate. During the two consecutive seasons involved investigations have been carried forward in the southern Cascades, along the Columbia River, in a broad belt across the state from Spokane to Puget Sound, and in southwestern Washington. Mr. Cantwell is continuing the work through the fall and winter months.

THE CENSUS BUREAU

According to the annual report of Director Rogers, of the Bureau of the Census, the

Census Bureau during 1918 directed a part of its energies to the compilation of war statistics. The increase in this class of work was so large that the number of employees engaged on it rose from 92 on July 1, 1918, to 231 on September 1.

The war work done by the bureau covers a wide range. Its more important phases include canvasses of manufacturers and dealers to ascertain the consumption and stocks on hand of certain raw materials used in war industries, and the production and stocks on hand of commodities made therefrom; the classification of occupations of military registrants, an undertaking that necessitated the handling and rehandling of more than 8,000,000 cards; estimates of population for use as a basis in the apportionment of the first draft; the allocation of enlistments; and the determination of registrants' ages from census records. In addition to carrying on these and other specific lines of work at the request of the war agencies of the government, the bureau has complied with many requests for information which had a bearing on the problems arising in connection with the war.

During the fiscal year the bureau carried on 13 regular and 7 special lines of work, in addition to the war work and the preparations for the Fourteenth Census. The regular inquiries included canvasses of water transportation and shipbuilding, of electrical industries, of religious bodies, of births and deaths, of state and municipal finance of cotton and cotton seed, and of stocks of leaf tobacco in the hands of manufacturers and dealers.

The work on birth and death statistics has been considerably expanded during recent years. These statistics are gathered only from those states and municipalities which maintain adequate registration systems.

The special work done by the bureau included a census of the Virgin Islands recently purchased from Denmark. These islands have a total area of 132 square miles, and the total population on November 1, 1917, was 20,051.

Another special line of work undertaken by the bureau was the tabulation of data covering the disputed areas of Europe and Africa—that is, those areas whose final disposition will be determined by the outcome of the war.

The force of the Census Bureau in Washington comprises 684 officials and employees, and in addition there are employed throughout the cotton belt approximately 700 local special agents who make periodical collections of cotton and cottonseed statistics.

In order to avoid waste and delay in the conduct of the next decennial inventory of the country's population, agriculture and industries, to be made in 1920, the bureau is carrying on such preparatory work as can be done prior to the enactment of the pending bill to provide for the Fourteenth Census. Under this bill, if it is enacted into law, all the clerical and subclerical force of the bureau will be appointed through open competitive examinations, held by the United States Civil Service Commission, as at the census of 1910.

The Fourteenth Census will cover the subjects of population; agriculture, including irrigation and drainage; manufactures; and mines, quarries and oil and gas wells. The undertaking will require the services of a field force of about 85,000 or 90,000, chiefly enumerators.

THE BUREAU OF STANDARDS

THE annual report for 1918 of Dr. Samuel W. Stratton, director of the Bureau of Standards, reports that the regular work of the bureau has yielded important results. Apart from new researches, a large volume of testing was completed, more than 300,000 separate tests being made. The construction of the new industrial laboratory, the completion of the metallurgical laboratory, and the building of a number of emergency war laboratories for airplane investigations were events of interest, and will be of great value in the development of the several branches of technology within the bureau's field.

When the United States entered the war, the bureau already possessed exceptional facilities, equipment, and personnel, chemistry and engi-

neering. This enabled it to take up promptly many important military researches. The laboratories, so useful during peace, proved of especial importance in war. The specialized equipment of instruments, materials and supplies were on hand which were then almost unobtainable elsewhere. The bureau promptly extended its service to all lines of scientific work which would assist in the war. Practically every section of its regular organization has had military problems of the most pressing nature submitted to it, and invaluable service has been rendered.

The recent expansion of the bureau has been on lines vital to the success of the war. It is interesting to note, however, that many of these lines are also of essential value to our industries in peace. The need for the national provision for master-gauge standardization was only realized by those in close touch with such work. The accurate dimensioning of the functioning parts of mechanisms will permit extending the American system of manufacturing interchangeable parts to its maximum usefulness. The importance of nation-wide standardization has long been known, but the practical working out of such standardization is best met by a national laboratory such as the Bureau of Standards. The same principle holds for all the technologies and special branches of physics.

The combination of pure science and technology has proved especially stimulating and effective. The close cooperation of physicists and engineers in practical as well as theoretical work has given an unusual breadth to such researches. In turn, the technologic facilities have proved of great value in the purely scientific work. Many cases might be cited where the elements of a research problem ramify into laboratories of practically every division of the bureau. The airplane is an example, and a problem apparently as simple as the spark plug has called for researches in many different technical sections of the bureau. The establishment of new industries in America, such as those of optical glass and chemical porcelain, and the scientific remodeling of older industries are fruits of the more intimate cooperation of science and industry which it is the function of the bureau to promote.

A fine laboratory for industrial research is nearly completed and will be ready for use in a few months. This laboratory, when completely equipped, will be one of the most effective of its kind in the world. In no national institution in the world is the union between pure science and practical technology so intimate as in the work of the Bureau of Standards.

Apart from confidential reports the bureau published during the year about 50 new publications, including scientific and technologic circulars and bulletins. Thirty-six confidential circulars were printed on the subject of aviation instruments alone. The establishment of the work on metals in a suitable laboratory building was followed by the establishment of experimental foundry and other research work on a practical basis. An interesting branch of the bureau's work is found in the field of public utilities, especially recent developments in regard to telephone service standards, and the standards of safety practise for power service, elevator service, crane construction, building construction, and the like.

SCIENTIFIC NOTES AND NEWS

Professor Edward M. East was elected president of the American Society of Naturalists at the recent Baltimore meeting.

Dr. C. M. Child, professor at the University of Chicago, has been elected president of the American Society of Zoologists.

Mr. Robert T. Jackson, of Peterborough, N. H., has been elected president of the Paleontological Society.

Dr. F. E. Wright, of the Geophysical Laboratory of the Carnegie Institution, has been elected president of the Optical Society of America.

The Society of American Foresters have elected the following officers for 1919: *President,* F. E. Olmsted; *Vice-president,* W. W.

Ashe; *Secretary,* P. D. Kelleter; *Treasurer,* A. F. Hawes; *Member of the Council for Five Years,* S. T. Dana.

AT the annual election for officers and councillors of the American Philosophical Society held on January 3, the following officers were elected: *President,* William B. Scott; *Vice-presidents,* George Ellery Hale, Arthur A. Noyes, Hampton L. Carson; *Secretaries,* I. Minis Hays, Arthur W. Goodspeed, Harry F. Keller, Bradley Moore Davis; *Curators,* Charles L. Doolittle, William P. Wilson, Leslie W. Miller; *Treasurer,* Henry La Barre Jayne; *Councillors,* to serve for three years, Maurice Bloomfield, John M. Clarke, George H. Parker, Arthur G. Webster.

THE officers of the American Public Health Association elected at the Chicago meeting are: *President,* Lee K. Frankel, New York City; *Vice-presidents,* Colonel John W. S. McCullough, Toronto, Ont.; Colonel Victor C. Vaughan, Ann Arbor, Mich., and Dr. John D. Robertson, Chicago; *Secretary,* A. W. Hedrick, Boston; *Treasurer,* Dr. Guilford H. Sumner, Des Moines, Iowa, and *Executive Committee,* Drs. Allan J .McLaughlin, U. S. P. H. S., Washington, D. C.; Charles J. C. O. Hastings, Toronto; Peter H. Bryce, Ottawa; John N. Hurty, Indianapolis, Ind., and William C. Woodward, Boston. The association will meet next year in New Orleans.

THE Perkin medal of the American Chemical Society has been awarded to Dr. F. G. Cottrell, of the U. S. Bureau of Mines, for his work on electrical precipitation.

DR. LIVINGSTON FARRAND, president of the University of Colorado and of the Rockefeller Anti-tuberculosis Commission, has been named an officer of the Legion of Honor on the proposal of Captain André Tardieu, French high commissioner to the United States. Selskar M. Gunn, of Boston, and Alexander Miller, have been made knights of the Legion of Honor.

CAMBRIDGE UNIVERSITY has conferred on Mr. F. W. Harmer the titular degree of M.A., *honoris causa.* Mr. Harmer, who is eighty-four years of age, served the office of mayor of Norwich about twenty-four years ago. The degree was granted in recognition of researches in geology, especially that of the eastern counties, which have occupied his chief attention for more than fifty years.

DR. FRANK M. SURFACE, of the Maine Agricultural Experiment Station, who has been in Washington for the past year and a half as assistant chief of the Statistical Division of the U. S. Food Administration, sailed for France in December 31 as Food Statistician of the American Commission to Negotiate Peace.

IT is reported that Brigadier Generals J. M. T. Finney and W. S. Thayer have been ordered back to the United States from France.

MAJOR WILLIAM A. HAMOR, Chemical Warfare Service, who returned from France in November, after ten months' service in the American Expeditionary Forces, has resumed his work at the Mellon Institute of Industrial Research as assistant director. Major Hamor served as assistant chief of the Technical Division of the Chemical Warfare Service until the conclusion of hostilities.

PROFESSOR F. C. NEWCOMBE, of the University of Michigan, has been granted leave of absence for the second half year on condition that he supply a substitute at his own cost.

DR. R. W. HESS, formerly chemist in the dyestuff department at the Chicago plant of the Sherwin-Williams Co., has recently accepted a position as senior research chemist with the National Aniline and Chemical Co., Buffalo, N. Y.

DR. WILLIAM V. P. GARRETSON has recently been appointed consulting neurologist to the Hospital of Functional Reeducation of Disabled Soldiers and Sailors, which is affiliated with Cornell Medical College, New York.

THE annual meeting of the Philosophical Society of Washington was held on January 4. The address of the retiring president was given by Dr. George K. Burgess on "Science and the after-war period."

THE inaugural address of the Listerian Society of King's College Hospital, London, was given by Sir St. Clair Thomson, who described

the advent of Lord Lister to King's College Hospital in 1877.

Dr. Rossiter Worthington Raymond, the well-known mining engineer, died on December 31 aged seventy-eight years.

The Journal of Industrial and Engineering Chemistry reports the deaths of Dr. Harry Percival Corliss, until recently an industrial fellow in the Mellon Institute of Industrial Research, University of Pittsburgh, at Ray, Arizona, on November 16, of pneumonia following influenza at the age of thirty-two years, and of Dr. Frank Amon, who had also been connected with the Mellon Institute as research fellow for some months and who had enlisted in the U. S. Gas Defense work in 1917. Dr. Amon died of pneumonia, at Souilly, France, on October 12.

Professor Golden, emeritus professor of practical mechanics in Purdue University, and since 1884 a member of the faculty, died on December 18, aged fifty-eight years.

Dr. Reginald Percy Cockin, assistant helminthologist of the London School of Tropical Medicine died on December 9 in his fortieth year.

The death is announced at the age of fifty-four years of Dr. Gustave Bouchardat, professeur agrégé in the Paris medical faculty and honorary professor in the school of pharmacy. Dr. Bouchardat has been a member of the Académie de Médecine, section of physical and medical chemistry, since 1882.

The medical college in Peking, China, under the auspices of the Rockefeller Foundation, which is now under construction, will cost $6,000,000, and will be open in 1920. Eighteen university buildings, forty faculty residences and a hospital with 200 beds will be constructed. A medical school will also be established at Shanghai and subsidiary medical stations will be established throughout China. Subsidies will be granted to existing missionary hospitals which will be standardized and will offer internships for the university. The work will require a total expenditure of $10,000,000 with an additional $250,000 to $500,000 annually for support.

Mr. P. W. Sprague, of Boston, has given farming lands to the Maine Agricultural and Industrial League to conduct as it sees fit. It is to be known as the league's demonstration farm. The property consists of five distinct farms, which have a total of more than 1,000 acres of land. On each farm is a set of buildings occupied by the families of the superintendent and caretakers.

The honorary treasurers of the Ramsay Memorial Fund announce that it is now just over £40,000. The aim of the appeal was £100,000. There are still a number of contributions to be received from the overseas committees which are collecting contributions. The Million Shilling Fund, opened by a donation of 1,000 shillings by the Prince of Wales, now totals over 58,000 shillings.

Announcement is made by the Association of the Alumni of the College of Physicians and Surgeons in the City of New York of its biennial Cartwright Prize of $500 to be awarded at commencement, 1919. Competitive essays, which must contain records of original investigations made by the writer, must be presented on or before April 1, 1919, typewritten in English and accompanied by the usual safeguarding device or motto.

The London *Times* calls attention to the serious effects of the influenza epidemic in India. In Bombay city there were 15,000 deaths, and in Delhi city, in a population of 200,000 the death-rate at one time reached 800 daily. In the rural tracts beyond the reach of effective prophylactic measures the loss has been tremendous. A recent report shows that in the Punjab it followed much the same course as in places attracting more public notice. The first signs appeared in August. In September it persisted in a mild form, and from the middle of October until November 8 it was acute. It is estimated that the number of deaths ranges from 5 to 10 per cent. of the population. The death-roll is heaviest amongst young adults and women. The number of deaths in the Punjab is estimated at 250,000. When the final results of the epidemic are summed up it will probably be

found that other provinces have suffered on approximately the same scale. No part of the country seems to have escaped, although the visitation was lightest in Bengal, and even the dry and bracing Himalayan tracts are reported to have been severely attacked. The population of the Punjab and the Punjab native states is about 24,000,000, and of the whole of India about 315,000,000. If the influenza death-rate proves as heavy throughout India as in the Punjab, this would give a total death-roll of over 3,000,000. It is planned to establish a Medical Research Institute in Bombay on the lines of the Rockefeller Institute to which large donations have already been promised.

THE library of the Rothamstead Experimental Station in England has received a check for £300 from the Carnegie Trust, for the purchase of important reference books. This is the second gift made by the Carnegie trustees to the library, a check for a like amount having been given two years ago. The object is to afford agricultural students and experts using the library the opportunity of consulting the most recent and most important treatises on agriculture and allied sciences. Two valuable gifts have also been received from Captain the Hon. Rupert Guinness. The library is fortunate in possessing an unusually good collection of early printed books on agriculture of the fifteenth and sixteenth and seventeenth centuries; to these Captain Guinness has now added perfect and beautiful copies of the first and second printed books on the subject—namely, the volume on agriculture by Crescentius, printed in 1471 at Augsburg, and Jensen's edition of the Latin agricultural writers, printed at Venice in 1472.

UNIVERSITY AND EDUCATIONAL NEWS

AN anonymous donor has agreed to pay over to the corporation treasurer of Vassar College dollar for dollar up to $150,000 provided a like amount was paid or pledged by the alumnæ not later than February 28, 1919.

PACIFIC COLLEGE at Newberg, Oregon, has received an addition of $15,000 to its endowment fund from the estate of Mary E. Mann.

THE faculty of medicine of Western University, London, Ont., is planning the erection of a new medical college building at an estimated cost of $100,000.

MEDICAL colleges have been organized in the military zone in France to be attended by military men and to teach military medicine. One of these colleges will be near Rheims where there are already 3,000 beds and 70 students. The curriculum comprises surgery, medicine, histology and medical physics.

THE school of chemistry of the University of Pittsburgh announces the following additions to its staff: Dr. Alexander Lowy, assistant professor of organic chemistry; Mr. Leon E. Jenks, assistant professor of analytical chemistry; Mr. Blaine B. Westcott, instructor in organic chemistry.

ASSISTANT PROFESSOR LEE IRVING KNIGHT, of the department of botany at the University of Chicago, has been appointed plant physiologist in the division of plant pathology at the Minnesota experiment station.

PROFESSOR HILTON IRA JONES has been elected head of the department of chemistry at the Oklahoma Agricultural and Mechanical College to succeed Dr. L. Chas. Raiford, who becomes associate professor of organic chemistry in the University of Iowa. Dr. Jones was formerly head of the department of chemistry at Dakota Wesleyan University, Mitchell, South Dakota.

DISCUSSION AND CORRESPONDENCE

TWO NEW INSTANCES OF POLYEMBRYONY AMONG THE ENCYRTIDÆ

DR. RAFFAELLE SARRA has recently published at Portici, Italy, two important papers, author's extras of which have just reached Washington. They are from the *Bulletin* of the Laboratory of General and Agricultural Zoology of the Superior School of Agriculture at Portici, Vols. X., and XII., and are entitled "Osservazioni Biologiche sull' Anarsia lineatella Z. dannosa al frutto del mandorlo" and

"La Variegana (*Olethreútes variegána Hb*) ed I Suoi Parassiti." The observations to which especial attention should be called in this connection are likely to be unnoticed by students of polyembryony, and this especial note is therefore written.

One of the parasites of *Anarsia lineatella* is *Encyrtus variicornis* Nees, a species not known to the present writer, but which was retained in the genus *Encyrtus* by Gustav Mayr in his monograph of the European Encyrtidæ. The only previous record of its rearing seems to have been by Nees, from a cell of *Eumenes coarctata,* and it now appears from the observations of Sarra that it is altogether likely that Nees's specimen came not from the larva of the Eumenes but from some lepidopterous larva stored in the cell.

Sarra finds that the female parasite lays eggs in the egg of the *Anarsia*; that the parasite egg gives origin to a number of larvæ which live within the larva of the *Anarsia* after it has hatched, in just the same way as do the other related larvæ as studied by Marchal and Silvestri.

The second case is that of an unnamed species of *Copidosoma* reared from the larva of *Olethreútes variegana.* Here too, the parasite eggs are laid in the egs of the *Olethreutes* and develop in its larvæ, 68 females and 80 males being reared from a single host larva.

These observations are of interest not only as adding two species to the list of polyembryonic forms, but, since *Encyrtus variicornis* has not previously been associated with the *Copidosoma* and *Leptomastix* group of *Encyrtidæ*, another genus is added to the list.

L. O. Howard

FOUNDATIONS OF MECHANICS

In a communication to Science of October 4, I used the term "doctrinal function" in the sense of a consistent body of postulates and theorems containing one or more undefined elements, but considered apart from any of the various interpretations that could be placed on the undefined elements. The introduction of this useful term "doctrinal function" was erroneously attributed to Bertrand Russell. It should have been attributed to Professor C. J. Keyser[1] who is the originator.

With reference to the criticisms by Professor Franklin and MacNutt, in Science of November 8, of my communication of October 4, I do not merge "identification" and "measurement," in the paper mentioned, but state that I think the distinction between them valueless in the context referred to. So far as the relation between mass and force is concerned, I was merely following Messrs. Franklin and MacNutt's words: "We prefer to define mass *quantitatively* (italics mine) in terms of the operation of weighing by a balance scale." Nothing other than a quantitative definition would be of value in the equation $f/a = m$.

The fundamentally defining quantities need not be the same as those kept by the Bureau of Standards. Temperature—the real temperature—is defined by Carnot engines, but they do not keep Carnot engines in the Washington bureau. Chemical affinity as measured with the help of a Weston standard cell is another example of the same thing. The verification comes from the totality of physical experience. "An experiment," says Duhem,[2] can never condemn (or validate) an isolated hypothesis but only a doctrine (*ensemble théorique.*"

Of course, there are other kinds of physics besides force physics, and it would be erroneous to say that any of the discussions exhausted all there is in the ideas of force, mass, etc.

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TROPICAL ENERVATION

The opinion is widespread, in northern climes, that a continuously warm climate, unbroken by sharp periodic changes, is ennervat-

[1] See Keyser, "Human Worth of Rigorous Thinking," p. 254, and "Doctrinal Functions," *Jour. of Philos., Psychol. and Sci. Methods,* Vol. XV., p. 262.

[2] "La Théorie physique," Paris, 1906.

ing and detrimental to the white man. This opinion is substantiated by a considerable variety of evidence. Under tropical or subtropic conditions the white man, according to this theory, can not do the same amount of sustained physical or intellectual work that he accomplishes in a cold climate.

The present paper will not attempt to controvert in full this theory of tropical "enervation," but merely aims to present conditions in the Hawaiian Islands as a specific instance to the contrary. The writer has resided in Hawaii for eleven years; his three children have been born there; and he has been much interested in the physiological relations of climate.

Hawaii, in the North Pacific Ocean, is subtropical. It is free from the intense humidity and heat of equatorial regions, and is cooled by trade winds that blow steadily from the northeast during most of the year. On the lowlands, where the entire population (250,000) resides, the annual thermal range is between 57° and 88° F., averaging 73° F. Honolulu, the only city in the islands (70,000 population), has an annual rainfall of about 42 inches, and a thermal range from 65° F. to 82° F.; mean temperature, 73° F.

The significant fact, which the writer wishes to strongly emphasize, is that the "white" population lives "American style," and differing in *no essential* from the mode of living customary in any northern city on the mainland. Habitation, clothing and food are essentially the same as one would find in the same class of society in Duluth, Winnipeg, Buffalo, Halifax, New York or Boston. The houses, of course, are not heated, and are somewhat more open and airy than are cold-climate houses. Otherwise they look like the houses in any American city. Summer-weight clothing, eastern style, is worn the year round. Americans wear exactly the same styles as in the eastern states. Most of the food is imported from the mainland.

The hours of labor for business men, professional men and laborers are just as long as in northern regions. The holidays and vacation periods are no more numerous. The lunch period is one hour, at noon, and there is no siesta. Agricultural laborers (mostly Orientals; some Caucasians, ex-Spanish and Portuguese) work in the fields the year round, with no winter rest period.

The American banker, doctor, lawyer, merchant works just as long and as diligently in Hawaii as he would or does in any northern city. A white laboring class does not exist in Hawaii. This is due, however, not to climatic conditions, but to the economic competition of cheap Oriental labor. In early days, before Hawaii was flooded with low-wage yellow labor, white men worked in the fields successfully, and with no evidence of physical deterioration.

White pupils in the public and private schools progress through the elementary, secondary and collegiate grades at the same rate as in cold climates; have essentially the same curriculum; do the same amount of study; and carry on the same kinds of recreation and athletics. Young men and women, born and educated in Hawaii, who have gone to the mainland schools (Wellesley, Vassar, Cornell, Stanford, Yale, Harvard, etc.), not only take equal rank with the other students there, but in many notable instances have shown unusual scholarship, leadership and athletic ability. White children growing up in Hawaii have much more outdoor life throughout the year than do the majority of cold-climate children. There are no Hawaiian diseases of infancy or childhood differing from those of other countries. The salubrious climate is extremely conducive to healthy infancy and childhood.

It must be acknowledged that the change from a northern to a subtropical climate does not always agree with the white woman. Some suffer from poor health, and more or less profound functional derangement. In many cases lactation is inadequate, or abnormal in other ways. A large percentage of white babies in Hawaii are bottle-fed. However, the problem is an open one, as to how much of the ill health of some white women in Hawaii is directly due to climatic maladaption, and

how largely due to other causes. White women in Hawaii represent a highly selected class—the wives and families of capitalistic and professional classes. Many white women in Hawaii have enjoyed excellent health, have raised large families of stalwart children, and have lived to ripe old age.

On the whole, there is little evidence of tropical "enervation" or lassitude among the white population of the Hawaiian Islands. In high moral, intellectual and physical life, tone and labors, this population compares most favorably with similar groups in any northern climate. In spiritual leadership, in literary and artistic productivity, in scientific and technical research, in financial and business organization and development, in agricultural exploitation, in sport and athletics—in fact, in every notable manifestation of the human mind and body, the white man in Hawaii has achieved remarkable success. He shows no signs of deterioration; on the contrary, in his efforts toward higher civic life, and toward the establishment of a permanent white middle class on the land, he shows that he is ever progressing to higher and higher levels.

Vaughan MacCaughey
College of Hawaii

SCIENTIFIC BOOKS

Stoichiometry. By Sydney Young, D.Sc., F.R.S. New York, Longmans, Green & Co. 1918. Pp. xii + 363. With 93 figures in the text. Second Edition. Price $3.75 net.

It is unfortunate, indeed, that general texts are not more often written by those who have done much research in the particular lines covered by the book—for the advantages of such authorship are plainly apparent in "Stoichiometry." Certainly no name of recent time has become more intimately associated with the *precise* determination of the physical constants of the gaseous and liquid states of aggregation than that of Young; and assuredly no one can speak with more authority than he of a subject which includes them; or treat with a clearer vision the things dependent upon them.

In this edition, the new experimental work, done since the original appearance of the book, has been ably summarized and included. In other respects, all that was said in praise of the first edition may be repeated even more emphatically in the case of the second. The inclusion of complete lists or references is one thing which renders the work especially valuable to the reader, for it thus serves as a point of departure for one wishing to make a more exhaustive study of any one of its component portions.

Like the same author's "Fractional Distillation," this is distinctly one of those books which should have a prominent place in every chemist's *working* library.

J. Livingston R. Morgan
Columbia University

THE PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES

The eighth number of Volume 4 of the *Proceedings of the National Academy of Sciences* contains the following articles:

Hereditary Tendency to Form Nerve Tumors: C. B. Davenpart, Station for Experimental Evolution, Carnegie Institution of Washington. The disease is not communicable. It affects blood relatives, both sexes nearly equally, and occurs without a break in the generations, about 50 per cent. of the individuals being affected. Apparently, therefore, the heredity factor in neurofibromatosis is dominant.

Arithmetical Theory of Certain Hurwitzian Continued Fractions: D. N. Lehmer, Department of Mathematics, University of California. Investigations on the successive values of the numerators and denominators of convergents.

On Closed Curves Described by a Spherical Pendulum: Arnold Emch, Department of Mathematics, University of Illinois. Some geometric properties of these curves are developed.

The Taxonomic Position of the Genus Actinomyces: Charles Drechsler, Cryptogamic

Laboratories, Harvard University. A morphological study for the purpose of determining the merits of various contending views.

Studies of Magnitudes in Star Clusters, VIII. A Summary of Results Bearing on the Structure of the Sidereal Universe: Harlow Shapley, Mount Wilson Solar Observatory, Carnegie Institution of Washington. A summary of results leads to a simple interpretation of star-streaming. The stars of Stream I. belong to the large moving cluster surrounding the sun, those of Stream II. belong to the galactic field.

Glacial Depression and Post-Glacial Uplift of Northeastern America: H. L. Fairchild, Department of Geology, University of Rochester. An illustration of the geophysical theory of isostacy.

A Bacteriological Study of the Soil of Loggerhead Key, Tortugas, Florida: C. B. Lipman and D. D. Waynick, College of Agriculture, University of California. A discussion of bacterial counts, nitrogen transforming powers of the soils, and nitrogen fixing powers and organisms.

Autonomous Responses of the Labial Palps of Anodonta: P. H. Cobb, Zoological Laboratory, Harvard University. The palp contains within itself the neuro-muscular organism necessary for the responses described, and therefore possesses an autonomy more complete than that of the vertebrate heart.

The Depth of the Effective Plane in X-Ray Crystal Penetration: F. C. Blake, Department of Physics, Ohio State University. In determining the value of h by means of X-rays, the "depth of the effective plane" was 0.203 mm. for calcite with a certain X-ray wave length. An attempt is here made to explain this theoretically.

The Myodome and Trigemino-Facialis Chamber of Fishes and the Corresponding Cavities in Higher Vertebrates: Edward Phelps Allis, Jr., Palais Carnolés, Menton, France.

The Effect of Inbreeding and Crossbreeding upon Development: D. F. Jones, Connecticut Agricultural Experiment station, New Haven. A continuation of work by East and Hayes on the naturally cross-pollinated corn plant, *Zea mays* L.

National Research Council: Executive Order Issued by the President of the United States May 11, 1918; Minutes of the Second Meeting of the Executive Board of the War Organization in Joint Session with the Council of the National Academy of Sciences; Minutes of Third Meeting of Executive Board of War Organization.

Report of the Annual Meeting of the Academy: Award of Medals; Research Grants from Trust Funds of the Academy.

THE ninth number of Volume 4 contains the following articles: *Metalliferous Laterite in New Caledonia:* W. M. Davis, Department of Geology and Geography, Harvard University. Laterite ores of the serpentine highlands seem to be local as to area of development and intermittent as to time or origin and duration of occurrence.

A Comparison of Growth Changes in the Nervous System of the Rat with Corresponding Changes in the Nervous System of Man: Henry H. Donaldson, Wistar Institute of Anatomy and Biology, Philadelphia. The five events in the growth of the nervous system of the rat, namely, (1) increase in total weight, (2) decrease in percentage of water, (3) accumulation of myelin, (4) maturing of the cerebellum, (5) attainment of mature thickness of the cerebral cortex, all take place at ages equivalent, or nearly equivalent to those at which they occur in man; and hence, by the use of equivalent ages there is a satisfactory method for making a cross reference between the rat and man.

Variation and Heredity During the Vegetative Reproduction of Arcella Dentata: R. W. Hegner, Zoological Laboratory, Johns Hopkins University. Within a large family of *Arcella dentata* produced by vegetative reproduction from a single specimen, there are many heritably diverse branches. These diversities are due both to very slight variations and to sudden large variations or mutations. The formation of such hereditarily diverse branches seems to be a true case of evolution

observed in the laboratory, and occurring in a similar way in nature.

The Importance of Nivation as an Erosive Factor, and of Soil Flow as a Transporting Agency, in Northern Greenland: W. Elmer Ekblaw, Crocker Land Expedition, American Museum of Natural History, and University of Illinois. Nivation and solifluction, characteristic processes of disintegration and denudation under subarctic or arctic conditions, appear to be of prime importance in the reduction of high relief of northern Greenland.

On the α-Holomorphisms of a Group: G. A. Miller, Department of Mathematics, University of Illinois. A solution of the problem: For what values of α is it possible to construct non-abelian groups which admit separately an α-holomorphism?

The tenth number of Volume 4 contains the following articles:

Measuring the Mental Strength of an Army: Major Robert M. Yerkes, Sanitary Corps, N. A. A review of the psychological undertakings in connection with the examination of the recruits for the U. S. Army.

Thermo-Electric Action with Thermal Effusion in Metals: A Correction: Edwin H. Hall, Jefferson Physical Laboratory, Harvard University. Supplementary to an earlier paper.

Invariants and Canonical Forms: E. J. Wilczynski, Department of Mathematics, University of Chicago. A general proof in the sense of Moore's general analysis of the fact that the coefficients of a unique canonical form are invariants.

Types of Phosphorescence: Edward L. Nichols and H. L. Howes, Department of Physics, Cornell University. Two types of phosphorescence known as *persistent,* and as *vanishing,* are distinguished and discussed. The types are apparently independent, and both may occur with a single source of excitation, and in a single substance.

The Smithsonian "Solar Constant" Expedition to Calama, Chile: C. G. Abbot, Smithsonian Astrophysical Observatory. A preliminary report on the aim and equipment of the Calama Expedition.

Maroon—A Recurrent Mutation in Drosophila: Calvin B. Bridges, Marine Biological Laboratory, Woods Hole.

Edwin Bidwell Wilson
Massachusetts Institute of Technology, Cambridge, Mass.

SPECIAL ARTICLES

ON THE NATURE OF THE PIGMENTATION CHANGES FOLLOWING HYPOPHYSECTOMY IN THE FROG LARVA

It has been shown by Smith[1] and by Allen[2] that the removal of the hypophysis fundament from the young larval frog is followed by a marked change in pigmentation. Within seven to ten days after the operation—which is most successfully performed when the larva is 3.5–4.0 mm. in length—the color of the tadpole changes from black to "silvery," or as Smith describes it, the larva becomes an albino.

Smith and Allen hold quite different views as to the nature of this pigmentation change. Smith thinks that the silvery appearance of the operated tadpoles is due to a reduction in the number of melanophores in the epidermis and to a loss of the individual pigment granules contained in these melanophores. He states that the melanophores are equally expanded in the albinos and in the controls, "consequently the lighter color of the albinos can not be due to the contracted condition of the chromatophores but must be referred, in part, to the reduced number of melanin granules in the pigment cells of the epidermis."

Allen, on the other hand, believes that the lighter color of the operated larvæ is due to the fact that the epidermal pigment cells have migrated to deeper positions and that the pigment cells are contracted throughout all parts of the body. He is convinced that "there is no disappearance and bleaching of pigment granules as asserted by Smith." Each of these observers, apparently, has based his conclusions upon the study of sections entirely. It will be recognized readily that in

[1] Smith, P. E., *Anatomical Record,* Vol. 11, p. 57, 1916.

[2] Allen, B. M., *Biological Bulletin,* Vol. 32, p. 117, 1917.

the study of such large cells as the amphibian chromatophores a much more satisfactory microscopic preparation may be obtained by mounting pieces of skin entire.

During the course of experimental studies on the relation of certain of the endocrine glands to pigmentation and growth changes in the frog, striking objective proof has been obtained that the "silvering" which follows hypophysectomy is due mainly to contraction of certain melanophores and not to any marked reduction in the amount of pigment material present.

The experiments to be described were performed upon larvæ of *Rana sylvatica*. This frog is very darkly pigmented in young stages and the "silvering" which follows hypophysectomy is consequently a very striking color change. The hypophysis was removed, following the methods of Allen and of Smith, at a stage just preceding the appearance of muscular activity. The operated larvæ were immediately returned to large crystallizing dishes containing city water (Ann Arbor, Mich.). Although this water is very hard and may contain traces of chlorine, there was not the high mortality among operated tadpoles which Allen noted. The characteristic silvering appeared from the eighth to the tenth day following the operation. As noted by the previous observers mentioned the operated larvæ were constantly smaller than controls of the same age and were somewhat more active.

When a length of from 12 to 14 mm. had been attained groups of the silvery larvæ were placed in a dilute extract of pars intermedia of beef pituitary or in an emulsion made by shaking a few mgm. of dried pars intermedia in 100 c.c. of distilled water. For each experiment a control group of larvæ was placed in an equal amount of distilled water. The larvæ placed in contact with the pars intermedia substance soon underwent a striking change from silvery to dark, in which condition they closely resembled the normal tadpole. This change began to be apparent in 15–30 minutes and attained a maximum in from one to three hours, depending on the strength of the extract or emulsion employed. When returned to fresh water the darkened larvæ soon regained their silvery appearance (one to three hours).

This experiment proves conclusively that the silvery appearance of the hypophysectomized larvæ is not due primarily to a loss of pigment substance. It indicates rather that it is due to a sustained contraction of pigment-bearing cells, which may be caused to expand again by suitable stimuli.

To test the validity of the latter assumption the experiment was repeated with the larvæ held in Clarke's observation chamber so that changes in the pigment cells could be watched under the microscope. In silvery larvæ the sub-epidermal melanophores were found to be contracted into dense spherical masses, whereas in normal larvæ the same cells were greatly expanded so that processes of neighboring cells were almost in contact. When a silvery larva was subjected to the action of an extract of pars intermedia the contracted pigment cells were seen to expand slowly. In one experiment a definite change in the cell under observation could be noted within eighteen minutes. The cell continued to expand slowly by sending out pseudopodia-like processes into which pigment granules could be seen to stream.

To further elucidate the nature of the pigment change *toto* mounts of pieces of skin stripped from normal and experimental larvæ after fixation in Bouin's fluid, were prepared. as follows: (*a*) normal, (*b*) silvery (hypophysectomized), (*c*) darkened silvery (hypophysectomized, under influence of pars intermedia extract).

In addition to the sub-epidermal melanophore with branches so numerous that a typical "mossy" appearance is presented, the skin of the normal frog larva contains another type of pigment cell, with relatively few branches, situated in the epidermis. The latter cells are said not to be contractile (Hooker[3]).

Skin mounts prepared from silvery larvæ show that the sub-epidermal pigment cells are

[3] Hooker, D., SCIENCE, N. S., Vol. 39, p. 473, 1914.

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contracted, some completely so that they form dense spherical masses; others are only partially contracted. This is in accord with what may be observed in the tail of the living silvery tadpole. Another feature which immediately attracts attention is the apparent absence of the epidermal melanophores. Upon closer examination the faint outlines of a few such cells may be made out. The cells contain very few pigment granules. Whether the remaining cells have migrated from the epidermis to deeper parts, as stated by Allen, or whether they have become invisible from loss of pigment granules could not be determined. It is apparent, however, that those occasional epidermal melanophores which may be identified contain only a small proportion of the number of pigment granules to be found in the normal condition. Whether the pigment granules have been changed and absorbed or have left the melanophore to become more widely distributed likewise has not as yet been established.

When a silvery larva has been darkened by the action of an extract of pars intermedia the sub-epidermal melanophores are found to be expanded, thus approximating the normal condition. The epidermal pigment cells, however, are not restored.

It may be concluded, then, that the change in color which follows hypophysectomy in the frog larva is due primarily to a contraction of the sub-epidermal melanophores. Only secondarily is it due to a loss of pigment granules from certain of the epidermal melanophores, and to a possible migration or loss of other epidermal melanophores.

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University of Buffalo

THE PALEONTOLOGICAL SOCIETY

The Paleontological Society held its tenth annual meeting at Baltimore, December 28, 1918, meeting in affiliation with the Geological Society of America. The meeting was held in the civil engineering building of Johns Hopkins University, with an attendance of about forty members and visitors. Following the business session and the presentation of appreciations of the life and work of four deceased members, the reading of papers bearing upon the various branches of paleontology and stratigraphy was commenced and continued until late in the afternoon. In the evening the members attended the annual dinner with the Geological Society of America at the Southern Hotel.

Of special mention among the papers presented, listed below, was the address of the retiring president, Dr. F. H. Knowlton, on "The evolution of geologic climates," in which the evidence of paleobotany was the predominant theme, and the papers on the Philosophical Aspect of Paleontology and the Economic Value of the Science. Important stratigraphic and paleontologic results were announced by the members particularly regarding the Coal Measures of Maryland, the Oxfordian of Cuba and the Tertiary rocks of South America.

The following papers were read:

Paleontologic Papers

Relation of the Holochoanites and the Orthochoanites to the Protochoanites, and the significance of the Bactritidæ: Amadeus W. Grabau.

On the inclusion of the Pleistocenic period in the Psychozoic Era: Amadeus W. Grabau.

The philosophical aspects of paleontology: John M. Clarke.

Characters and restoration of Cope's Sauropoda: Henry Fairfield Osborn.

Camarasaurus and Amphicœlias from Canyon City: Henry Fairfield Osborn and Charles C. Mook.

Orthogenetic development of the costæ in the Perisphinctinæ: Marjorie O'Connell.

Discovery of the Oxfordian in western Cuba: Barnum Brown and Marjorie O'Connell.

A new Eurypterid horizon: George H. Chadwick.

The economic value of paleontology: Ralph Arnold.

Stromatopora growth on edgeon conglomerates from the Silurian: John M. Clarke.

Stratigraphic Papers

The age of certain plant bearing beds and associated marine formations in South America: Edward W. Berry.

The stratigraphy and correlation of the coal measures of Maryland: Charles K. Swartz, W. A. Price, Jr., and Harvey Bassler.

The typical section of the Allegheny formation: Charles K. Swartz and Harvey Bassler.

The Eocene divisions of California: Bruce L. Clark.

Some problems of the Adirondack Precambrian: Harold L. Alling.

Permo-Triassic of northwestern Arizona: Harvey W. Shimer.

The stratigraphy and structure of the Newark system in Maryland and its relation to the Newark system of eastern North America: George Edwin Dorsey.

Remarkable persistence of thin horizons: GEORGE H. CHADWICK.

Portage stratigraphy in western New York: GEORGE H. CHADWICK.

The result of the ballots for officers for 1919 was as follows:

President—Robert T. Jackson, Peterborough, N. H.

First Vice-president—Gilbert Van Ingen, Princeton, N. J.

Second Vice-president—Walter Granger, New York City.

Third Vice-president—T. Wayland Vaughan, Washington, D. C.

Secretary—R. S. Bassler, Washington, D C..

Treasurer—Richard S. Lull, New Haven, Conn.

Editor—W. D. Matthew, New York City.

R. S. BASSLER,
Secretary

THE AMERICAN PSYCHOLOGICAL ASSOCIATION

THE American Psychological Association held its twenty-seventh annual meeting at Johns Hopkins University on December 27 and 28. Considering the fact that many of the members made other plans when it was announced in November that there would be no meeting, the sessions were very well attended, there being about seventy members present. Owing to illness the president, Professor J. W. Baird, of Clark University, was not able to preside nor to give his presidential address.

The papers consisted with one exception of descriptions of the war activities of the members. The program was as follows: Research in psycho-pharmacology, Dr. David I. Macht; Study of ocular functions with special reference to aviation, Professor C. E. Ferree; Revision of the definition for "moron"; Captain R. L. Sylvester; Psychology of morale, Major Wm. S. Foster; Selection and training of telegraphers, Professor L. L. Thurston; Some problems of reeducation, Professor S. I. Franz; Principles underlying the classification of men in the Students' Army Training Corps, Professor T. L. Kelley; Examination of the emotional fitness for warfare, Professor R. S. Woodworth; Practical application of army trade tests, Major J. W. Hayes; Army personnel work: implications for education and industry, Lieutenant Colonel W. V. Bingham; The work of the psychological committee of the National Research Council and of the Division of Psychology, Major R. M. Yerkes; Methods of mental testing used in the United States Army, Major Lewis M. Terman; Psychological service in army camps, Major George F. Arps; Results and values of psychological examining in the United States Army, Dr. Mabel R. Fernald; The relation of intelligence to occupation as indicated by army data, Dr. J. W. Bridges; Some possible effects of the war on American psychology, President G. Stanley Hall; Functions of psychology in rehabilitation of disabled soldiers, Major Bird T. Baldwin; A program for mental engineering, Lieutenant Commander Dodge; Official method of appointing and promoting officers in the Army, Colonel Walter Dill Scott; Psychological investigations in aviation, Major Knight Dunlap; Speech reconstruction in soldiers, Professor W. B. Swift.

Saturday afternoon there was a symposium upon "The future of pure and applied psychology." Professor Thorndike expressed the opinion that in twenty years there would be as many "doing" as teaching psychology, but that both groups must be thoroughly scientific. He saw no reason why the Ph.D. degree in psychology should not represent both types. President Hall stated that psychology should be kept pure, but not so pure that it could not be helpful. Its motto should be "service" in the best sense of the term. Major Yerkes discussed the future relation of psychology to a permanent National Research Council.

Professor E. L. Thorndike, as the retiring vice-president of Section H of the American Association for the Advancement of Science, delivered an address upon "Scientific personnel work in the army" and Professor E. F. Buchner as retiring vice-president of Section L of the American Association for the Advancement of Science spoke upon "Scientific contributions of the educational survey."

A brief report of the contents of all the papers will be made in the February number of *The Psychological Bulletin.*

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Colonel Walter Dill Scott was elected president of the association for 1919 and Major Bird T. Baldwin and Major Lewis M. Terman members of the Council.

Herbert Sidney Langfeld
Secretary

THE OPTICAL SOCIETY OF AMERICA

The third annual meeting of the Optical Society of America was held under the auspices of the American Association for the Advancement of Science in Baltimore, December 27. The program consisted of the scientific papers listed below with a Symposium on The Future of Applied Optics and a business meeting.

MORNING SESSION, 9:30

The colorimetry of white surfaces: A. P. Pfund.

The measurement of reflection and transmission factors: M. Luckiesh.

The design of lenses for aerial photography and tests of calcium as a desiccator in optical instruments: C. W. Frederick.

Retinal fatigue for luminosity with spectral stimuli: L. T. Troland.

A new yellow dye and light filters made from it: C. E. K. Mees and H. T. Clarke.

The contraction of photographic images: F. E. Ross.

Refinements in spherometry: G. W. Moffitt.

The problem of magnification in fire control instruments, and The transmission of certain glasses in the absorbent region: E. D. Tillyer.

A possible new lens material: P. G. Nutting.

A chart method of testing photographic lenses: L. E. Jewell.

Monocular vs. binocular field glasses: E. P. Hyde and Committee.

A testing apparatus for stereoscopic vision: H. Kellner.

A one-term pure exponential formula for the spectral distribution of radiant energy from a complete radiator: I. G. Priest.

Photoelectric spectrophotometry by the Null method: K. S. Gibson.

The protection of silvered surfaces: F. L. G. Kollmorgen.

The proper type of absorption glass for an optical pyrometer: P. D. Foote.

Some characteristics of glasses in the annealing range: A. Q. Tool and J. Valasek.

Expansion coefficients of optical glasses: C. G. Peters.

AFTERNOON SESSION, 2 P.M.

Symposium on Applied Optics, with Special Reference to the Future of the Optical Industry in this Country.

I. *The optical industry in war time:* Dr. F. E. Wright.

II. *The readjustments of the industry to peace-time demands for, and the future of manufacturing in:*
1. *Optical glasses:* Dr. G. W. Morey.
2. *Photographic lenses and cameras:* Mr. C. W. Frederick.
3. *Projection apparatus:* Dr. H. P. Gage.
4. *Microscopes, field glasses and telescopes:* Dr. H. Kellner.
5. *Photographic goods:* Dr. C. E. K. Mees.
6. *Special research apparatus:* Mr. P. V. Wells.
7. *Spectacle lenses and optometry:* Mr. E. D. Tillyer.
8. *Illuminating engineering:* Dr. E. P. Hyde.

III. *The future of applied optics and the future needs for:*
1. *Education and training:* Dr. Mees and Professor Southall.
2. *Scientific control in manufacturing:* Dr. Kellner and Mr. Keuffel.
3. *Testing and research:* Dr. Nutting.

EVENING SESSION, 7:30 P.M.

Business meeting.

The meeting was an enthusiastic one attended by about 80 persons. Resolutions were passed and committees appointed looking toward the closer cooperation between designers, manufacturers and users of optical goods of all kinds in America.

The officers of the society for 1919 are:

President—Dr. F. E. Wright, Geophysical Laboratory, Washington.

Vice-president—Professor F. K. Richtymer, professor of physics, Cornell.

Secretary—Dr. P. G. Nutting, Westinghouse Research Laboratories.

Treasurer—Mr. Adolph Lomb, Bausch & Lomb Optical Company.

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The next general meeting of the society will be held in connection with American Association for the Advancement of Science next December.

P. G. Nutting,
Secretary

SCIENCE

A Weekly Journal devoted to the Advancement of Science, publishing the official notices and proceedings of the American Association for the Advancement of Science

Published every Friday by

THE SCIENCE PRESS

LANCASTER, PA. GARRISON, N. Y.
NEW YORK, N. Y.

Entered in the post-office at Lancaster, Pa., as second class matter